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(54) **Friction clutch**

(57) A friction clutch, especially for motor vehicles, comprises a pressure plate (1) coupled to the flywheel or, as shown in Fig. 1, to the cover (13) by leaf springs (3) riveted to the rear face of the plate in gaps formed in a rib (4) against which the diaphragm spring acts. The rivet heads in this case are received in radial cooling slots in the friction face of the plate. The springs may alternatively be L-shaped (Fig. 5) or twisted (Fig. 7), in which latter case they are riveted to periphery of the rib (4). The rivets securing the springs to the pressure plate may be tubular or may be machined flush with the friction face, and those securing the springs to the cover may be integral with the cover. In each case, the pressure plate can have a cylindrical periphery which may be machined for a close fit in the cover and to improve dynamic balance.

FIG.1

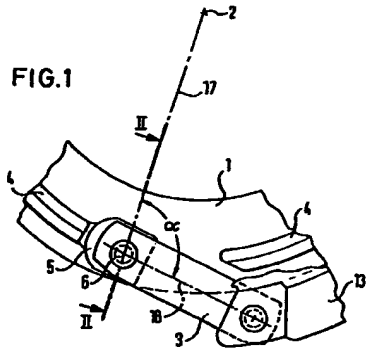

FIG.5

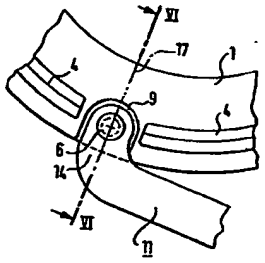

FIG.7

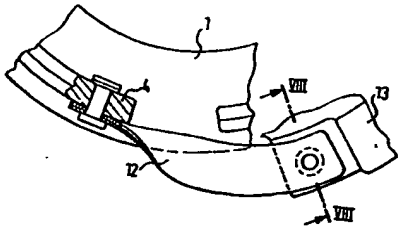

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FIG.1

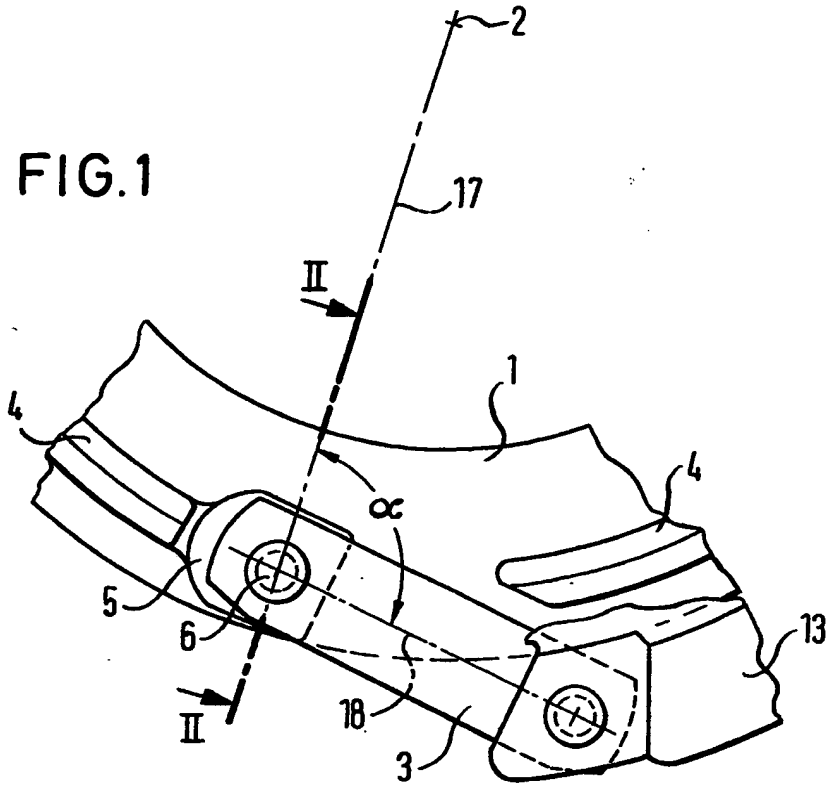



FIG.2

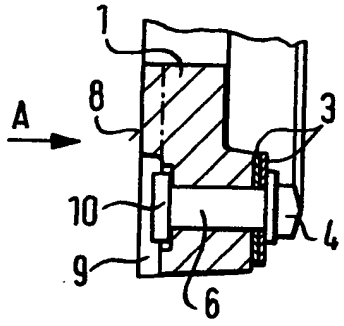
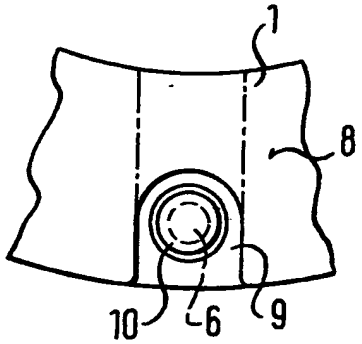



FIG.3



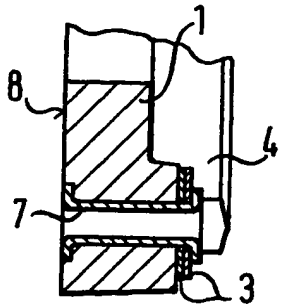




FIG.4

FIG.5

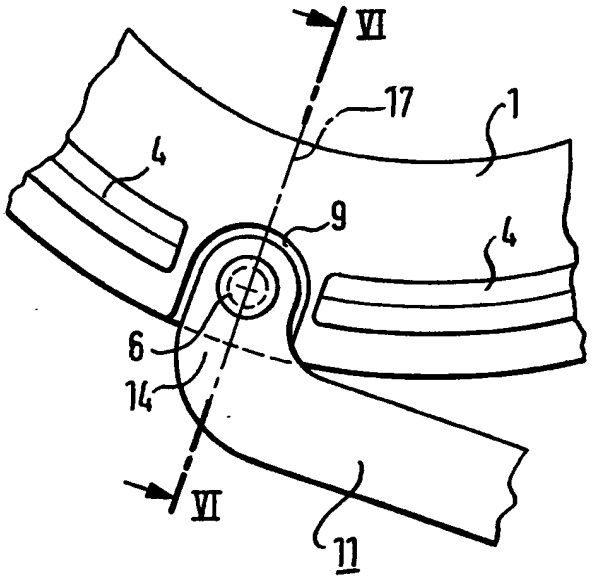



FIG.6

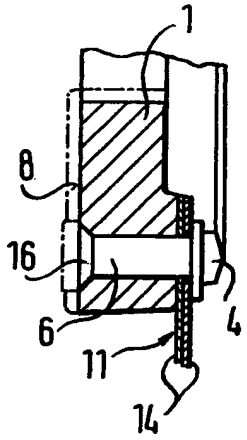



FIG.7

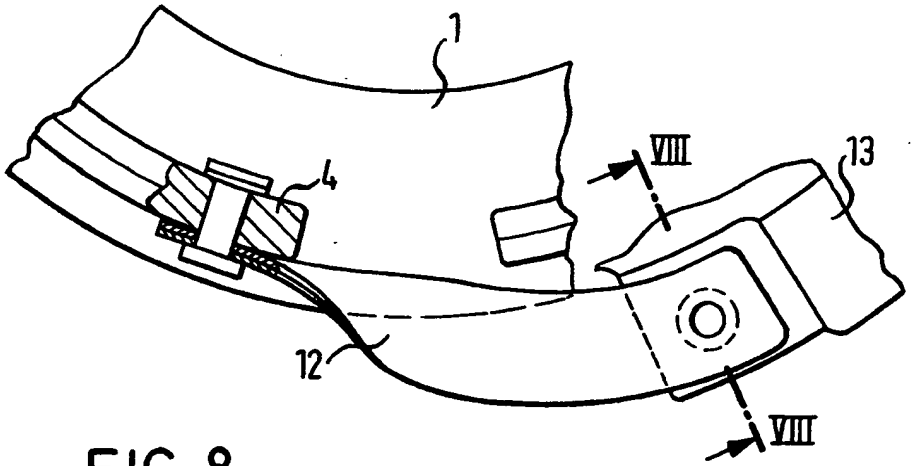



FIG.8

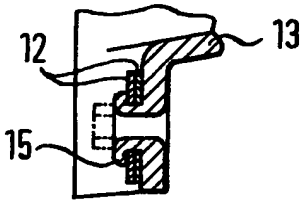
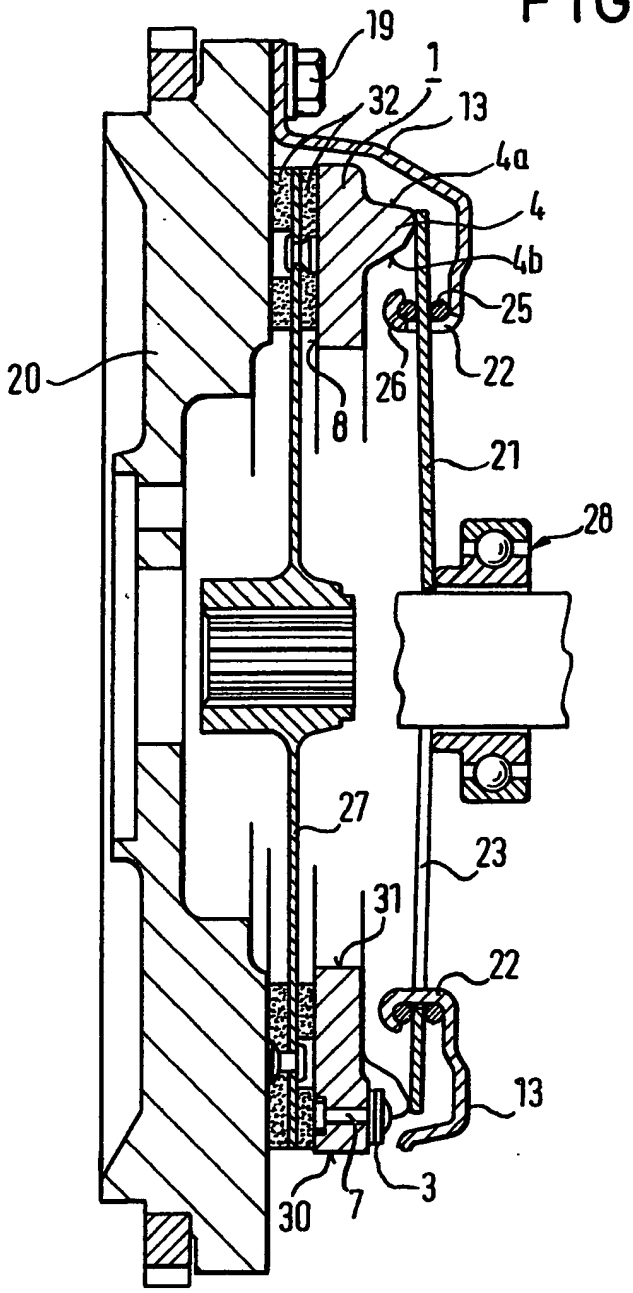


FIG.9



SPECIFICATION
**Friction clutch**

The invention relates to a friction clutch, especially for motor vehicles, consisting *inter alia* of a flywheel as counter-pressure plate, a pressure plate which is connected fast in rotation but axially movably through leaf spring elements with the flywheel, directly or through securing points on the clutch housing, a spring device for generating a pressure-application force upon the pressure plate for clamping in a clutch disc between the latter and the flywheel, and a ventilation device for the pressure plate.

Friction clutches of the above-stated kind of construction are known for example from German Publication Specification 2,647,703. In this known friction clutch the pressure plate has, radially outside its circular external contour, individual noses to which the leaf spring elements are riveted for their suspension. These noses are ordinarily cast like the remainder of the pressure plate, and not worked further. Moreover from German Patent Specification 1,255,406 a friction clutch with leaf spring elements is known, which elements extend substantially radially, are externally connected with the housing and inwardly riveted likewise to noses of the pressure plate, these noses pointing radially inwards and protruding inwards beyond the annular internal contour of the pressure plate. Both forms of embodiment require more construction space than is necessary and have the disadvantage that they cannot be worked on their external or internal contour, so that firstly the installation tolerances must be made larger and further, naturally, there is a greater want of balance due to the casting tolerances.

It is therefore the problem of the present invention to produce a pressure plate connection which is suitable both for flat and for pot-shaped flywheels, is especially operationally reliable, has a small space requirement and can be produced with minimum expense.

According to the invention we provide a friction clutch, especially for motor vehicles, comprising a flywheel serving as counter-pressure plate, a pressure plate which is connected fast in rotation but axially movably through leaf spring elements with the flywheel, directly or through securing points on the clutch housing, a spring device for generating a pressure application force upon the pressure plate for the clamping in of a clutch disc between the latter and the flywheel and a release device for the pressure plate. The leaf spring elements are secured on the pressure plate side in the region remote from the friction face facing the clutch di c. Du to this arrangement of the leaf spring elements it i possible to machine the pressure plat on its external circumf rence by a turning operati n, whereby firstly the installation t leranc s in th clutch h using or in th flywheel can be reduced, which additionally also increases th rotation speed stability, and also the still xisting slight want of balance can tak place in a once-only balancing by what is called balance-turning in the assembly condition of the clutch.

The rivets provid d for securing may be arranged with their rivet heads count rsunk in recesses of the friction face. The recesses may extend throughout the whole radial extent of the friction face.

Due to these features, a cooling effect directly on the friction face can be achieved and provision can be made at the same time for the removal of the abraded material from the friction lining, by the indented arrangement of the rivet heads. If, however, this loss of friction area is not acceptable after the riveting of the leaf spring elements the machining of the friction face on the pressure plate can take place, so that the residues of the rivet head are effective as friction face. The longitudinal extent of the leaf spring elements and a line through the centre rotation of the clutch and the riveting position on the pressure plate enclose a substantially right angle. Due to this measure an especially favourable force introduction of the torque in thrust operation is achieved, so that the leaf spring elements are loaded purely tangentially without radial force component, at this higher loading.

An especially space-saving arrangement — above all with regard to the interruption of the flange for the support of the diaphragm spring — may be achieved in that the leaf spring elements may be made somewhat L-shaped in plan view, with the short leg starting from the securing point on the pressure plate extending somewhat radially outwards. To effect a saving of costs and for intact friction face use the pressure plate may be provided on the side remote from the friction face with an approximately cylindrically formed flange on which the leaf spring elements are secured, twisted through about 90° in relation to their securing on the clutch housing.

The invention will be explained in greater detail below by reference to the examples of embodiment illustrated in the Figures, wherein individually:—

Figure 1 shows the partial elevation of a pressure plate with a leaf spring element;

Figures 2, 3 and 4 show partial sections or elevations of the arrangement of the rivets for the securing of the leaf spring elements;

Figures 5 and 6 show an elevation and a section of L-shaped leaf spring elements;

Figures 7 and 8 show a partial elevation and section of twisted leaf spring elements;

Figure 9 shows a diagrammatic representation of the overall construction of the clutch.

In Figure 1 a part of a pressure plate 1 is illustrated. The view is here of the side of the pressure plat opp site to the friction face, which side has a flang 4 for the support of an appropriat diaphragm spring in the installed condition. The clutch housing 13 surrounding th clutch is lik wise partially visible. 2 designates th c ntre of rotation f the entir clutch and thus also of th pressure plate 1. Th rotation-fast connection betw en th pressure plate 1 and the

clutch housing 13 takes place through a plurality of leaf spring elements 3 arranged in distribution on the circumference. It is entirely possible to install a plurality of these leaf spring elements 3 as a pack at each of these securing points. In the present case the leaf spring elements 3 are represented as sheet metal strips made flat and substantially straight, where the line 18 between the two securing points likewise represents substantially the line of symmetry. The line 17 which is laid through the centre point 2 of rotation and the rivet 6 for the securing of the leaf spring elements to the pressure plate 1 forms an angle $\alpha$ with the line 18, this angle $\alpha$ amounting to substantially 90°. For supporting the leaf spring elements 3 on the pressure plate 1 a support face 5 is provided. The other end of each of these leaf spring elements 3 is riveted to the clutch housing 13. The position of riveting with the support face 5 is situated on the side of the pressure plate 1 remote from the friction face. Thus the flange 4 for the support of the diaphragm spring is interrupted in this region. According to Figures 2 and 3, namely section II—II and elevation A, in the friction face 8 of the pressure plate 1 at least one recess 9 is provided in which the rivet head 10 of the rivet 6 is situated, so that no contact takes place between the rivet head 10 and the clutch disc (not shown). According to Figure 3 the recess 9 can be formed over the whole radial extent of the friction face 8 of the pressure plate 1. In this case not only is the abraded material of the clutch disc conveyed away to the exterior, but also a ventilation effect is achieved. The pressure plate 1 has a cylindrical external contour which can be worked by a turning operation and thus firstly is very accurately dimensioned and furthermore avoids the noses according to the prior art which render balancing difficult. Furthermore in the radial direction a clear gain in space becomes visible.

Figure 4 shows a riveting modified in comparison with Figure 2, where firstly a hollow rivet 7 is used and also the rivet head of this hollow rivet does not necessarily have to lie in a recess according to Figures 1 to 3, since here the abraded material can be conducted away through the hollow rivet itself. Here as in Figure 2 it can be seen that by way of example two leaf spring elements 3 are arranged one beside the other.

Figures 5 and 6 show a leaf spring element 11 which is made somewhat L-shaped in plan view and extends with its shorter leg 14 approximately in alignment with the line 17, whereby the recess in the flange 4 can be made smaller. At the same time it becomes visible from Figure 6 that by partially countersunk arrangement of the rivet head 16 and subsequent working of the friction face 8, the remainders of the rivet head 16 are used as friction face and thus interruption of the friction face at this point does not take place.

In Figures 7 and 8 there are represented twisted leaf spring elements which on the one hand are riveted in the usual way to the clutch housing 13, but on the other hand in the region of the flange 4 are riveted on a substantially cylindrical face. Thus it is necessary to provide the leaf spring elements 12 with a twist. The securing of the leaf spring elements 12 on the flange 4, which is already present for the support of the diaphragm spring, is therefore especially simple and space-saving. By appropriate arrangement of the riveting position on the clutch housing 13 it can even be possible to make the flange 4 without interruption in the circumferential direction. For further simplification of the construction the riveting to the clutch housing 13 is provided so that the rivet bead 15 is formed out of the material of the clutch housing 13 and riveted.

Due to the described leaf spring formations and arrangements on the pressure plate a machining on the external circumference of the pressure plate is rendered possible, whereby very close tolerances can be maintained. Furthermore thus a substantially smaller want of balance results in the pressure plate itself. This form of embodiment of the pressure plate renders possible a once-only balancing by balance turning in the assembled condition of the clutch. Furthermore the rotation speed stability of the pressure plate is increased by the external machining and elimination of the dogs with tangential leaf spring securing. Due to the force introduction in thrusting operation under an angle of about 90° the loading of the leaf spring elements is reduced due to the fact that no additional radial forces occur in the force introduction. In this connection it should be pointed out that the stressing of the leaf spring elements in thrust operation is assumed as many times higher than in pulling operation.

In Figure 9 there is represented diagrammatically the overall assembly of a clutch on which the measure according to the invention is realised somewhat in the style of Figures 1 and 4. In Figure 9 a flywheel is designated by 20. The clutch housing 13 is secured by screws 19 to this flywheel 20. The pressure plate 1 is accommodated within the clutch housing 13. The pressure plate 1 is secured to the clutch housing 13 by a plurality of tangential leaf spring packs 3 distributed over its circumference, which as may be seen from Figure 4 are secured each with its one end by rivets 7 to the pressure plate 1 and by its other end to the clutch housing 13. On the pressure plate 1 there is further seen the flange 4. A diaphragm spring 21 is fixed to the clutch housing 13, namely by hooks 22. The hooks 22 engage through slots 23 in the diaphragm spring 21. Wire rings 25 and 26 are inserted into the hooks 22 and provide an abutment on both sides for the diaphragm spring 21 on the clutch housing. The diaphragm spring 21 is clamped in between the wire ring 25 and the flange 4 in such a way that it initially stresses the pressure plate 1 with its friction face 8 in the direction towards the flywheel 20. The friction lining 32 of a clutch disc 27 is clamped in between the friction face 8 and the flywheel 20. On the radially inner edge of the diaphragm spring 21 there acts a releaser 28. When the releaser 28 is moved to the left in

Figure 9, the diaphragm spring 21 is tilted about the wire ring 26 so that the pressing action of the diaphragm spring upon the pressure plate 1 ceases and the friction face 8 is lifted away from the clutch linings 32.

The radially outer defining face of the pressure plate 1 is designated by 30 in Figure 9, and the radially inner defining face by 31. The two faces 30 and 31 are faces of rotation which extend without interruption over the entire circumference of the pressure plate 1. It is of essential importance to the invention here that the securing of the tangential spring packs 3 on the pressure plate 1 lies between the faces 30 and 31.

It can readily be seen that in the clutch according to Figure 9 the form of embodiment according to Figures 2, 3; 5, 6 and 7, 8 can also be used. If the form of embodiment according to Figures 7 and 8 is used, the radially outer defining face 4*a* and the radially inner defining face 4*b* of the flange 4 will preferably be made as cylinder surfaces.

CLAIMS

1. Friction clutch, especially for motor vehicles, consisting *inter alia* of a flywheel (20) as counter-pressure plate, a pressure plate (1) which is connected fast in rotation but axially movably through leaf spring elements (3, 11, 12) with the flywheel (20), directly or through securing points on the clutch housing (13), a spring device (21) for generating a pressure application force upon the pressure plate (1) for the clamping in of a clutch disc (27) between the latter and the flywheel (20) and a releaser device (28) for the pressure plate, characterised in that the leaf spring elements (3, 11, 12) are secured on the pressure plate side in the region remote from the friction face (8) facing the clutch disc.

2. Friction clutch according to Claim 1, characterised in that the rivets (6) provided for securing are arranged with their rivet heads (10) countersunk in recesses (9) of the friction face (8).

3. Friction clutch according to Claim 2, characterised in that the recesses (9) extend throughout the whole radial extent of the friction face (8).

4. Friction clutch according to Claim 1, characterised in that the machining of the friction face (8) of the pressure plate (1) takes place after the riveting of the leaf spring elements (3, 11, 12) and thus the rivet cross-sectional area is available as friction face.

5. Friction clutch according to any one of Claims 1 to 4, characterised in that the longitudinal extent (line 18) of the leaf spring elements (3) and a line (17) through the centre of rotation (2) of the clutch and the riveting position (rivet 6) on the pressure plate (1) enclose a substantially right angle.

6. Friction clutch according to Claim 4, characterised in that the leaf spring elements (11) are made somewhat L-shaped in plan view, with the short leg (14), starting from the securing point on the pressure plate (1), extending somewhat radially outwards.

7. Friction clutch according to Claim 1, characterised in that the pressure plate (1) is provided on the side remote from the friction face (8) with an approximately cylindrically formed flange (4) on which the leaf spring elements (12) are secured, twisted through about 90° in relation to their securing on the clutch housing (13).

8. Friction clutch according to any one of Claims 1 to 7 characterised in that the securing of the leaf spring elements (3, 11, 12) on the housing side takes place on the rivet bead (15) drawn out of the material of the clutch housing (13).

9. Friction clutch according to any one of Claims 1 to 8 characterised in that the pressure plate (1) is defined on its outer circumference by an external surface of rotation (30) closing over its entire circumference, and in that the points of fastening of the leaf spring elements (3) on the pressure plate (1) lie radially within the surface of rotation (30).

10. Friction clutch according to Claim 9, characterised in that the pressure plate (1) is also defined on its radially inner circumference by an inner surface of rotation (31) closed on the entire circumference and in that the fastening points of the leaf spring elements (3) on the pressure place (1) lie between the outer surface of rotation (30) and the inner surface of rotation (31).

11. Friction clutch according to Claim 9 or 10, characterised in that at least one of the rotation surfaces (30, 31) is machined in swarf-removing manner.

12. Friction clutch substantially as described with reference to the accompanying drawings.

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